# City of San Diego
# Chollas Creek Water-Effect Ratio Study and Draft Results

Presentation to the Chollas Creek Stakeholders
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think BLUE
SAN DIEGO

# Background

- **The Chollas Creek Dissolved Copper, Lead, and Zinc TMDL is based on conservative baseline criteria.**

- **The study goal is to calculate a water-effect ratio (WER) and develop a site-specific objective (SSO) for dissolved copper, lead, and zinc.**

# The Chollas Creek Dissolved Metals TMDL states:

- **The development of a site-specific objective is an acceptable step in determining appropriate targets for dissolved copper, lead, and zinc in Chollas Creek.**
- **Supported by the State Implementation Policy.**
- **If WER studies and scientific evidence indicate that site-specific objectives are appropriate in Chollas Creek, and that these site-specific objectives will protect the beneficial uses of this waterbody, the TMDL will be modified accordingly.**

# Chollas Creek Metals Summary

- **Dissolved copper is the most frequently exceeded metal for the acute criteria.**
- **Dissolved lead has never exceeded acute criteria. Few chronic lead exceedances noted. Lead criteria is being revised by EPA.**
- **Dissolved zinc has fewer exceedances and primarily in the north fork.**
- **South fork has fewer metals exceedances in comparison to the north fork.**

# How the California Toxics Rule and the WER works

Hardness from site stays as is

=WER x (0.96) * {e^ [0.9422 * ln (hardness) -1.700]

| Hardness mgCaCO3/L | Water-effect Ratio | CMC (Acute) Dissolved Copper | Sample Result (1/18/2010) | Comparison to CTR | Ratio to CTR |
|---|---|---|---|---|---|
| 22.1 | 1 | 3.24 | 7.3 | above CTR by | 2.25 |

CTR Without WER

| Hardness mgCaCO3/L | Water-effect Ratio | CMC (Acute) Dissolved Copper | Sample Result (1/18/2010) | Comparison to CTR | Ratio to CTR |
|---|---|---|---|---|---|
| 22.1 | 3 | 9.72 | 7.3 | below CTR | 0.75 |

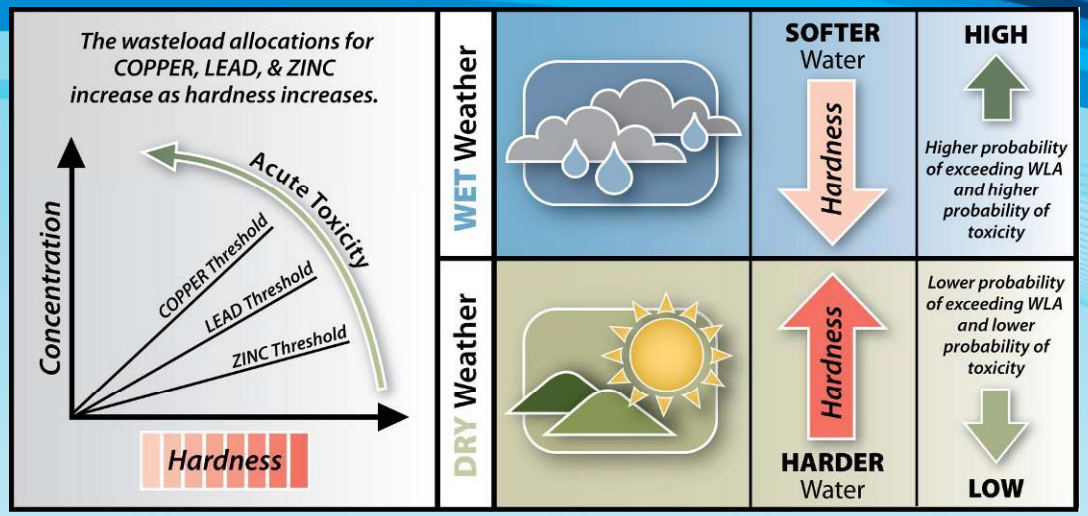
CTR With WER

Note new Site Specific Objective WER = 3

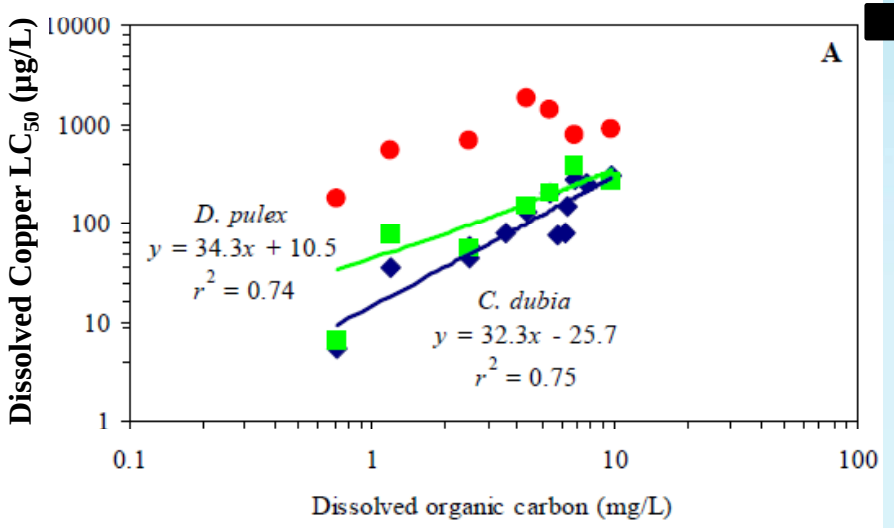
Sample result also stays as is

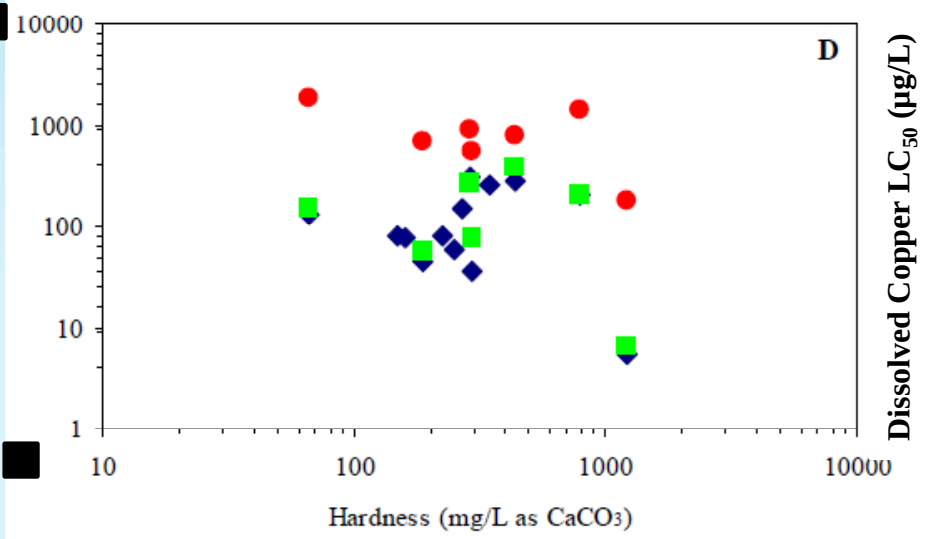
CTR With WER

# Relationship of Hardness and Dissolved Organic Carbon to Copper Toxicity




C. dubia=blue diamonds
D. pulex=green squares
P. promelas=red circles




Source: Parametrix and Hydroqual, 2006

# Rationale for WER Study

1. **Historically, toxicity in Chollas related to pesticides not dissolved metals.**

2. **Dissolved organic carbon influences toxicity more than other water quality parameters.**

3. **USEPA recognizes that dissolved metals criteria may be more or less protective (USEPA, 1994)[1].**

4. **Previous WER studies (e.g., Calleguas Creek and South San Francisco Bay) indicate copper WER >1, most lead and zinc final WER > 1.**

1. USEPA. 1994. Interim Guidance on Determination and Use of Water-Effect Ratios for Metals. EPA-823-B-94-001

# Final WER/SSO Calculations

$$WER = \frac{EC_{50}\ \text{Site Water}}{EC_{50}\ \text{Control Water}}$$

- **Separate WER for each site, flow event.**
- **Final WER (FWER) Options =**
  - use the geometric mean of some or all of the WERs
  - or use most conservative WER
- **Site-specific objective for Chollas Creek:**

***CCC = (WER) * (CFC) * {e^[(mC * ln hardness)+bC]} * MOS***

# Draft Results

| DPR2-South Fork | Copper WER | Zinc WER |
|---|---|---|
| Event 1-DPR2 | 27.00 | 1.47 |
| Event 2-DPR2 | 45.03 | 3.31 |
| **Min (DPR2), Conservative** | **27.00** | **1.47** |

| SD8(1)-North Fork | Copper WER | Zinc WER |
|---|---|---|
| Rangefnder WER-SD8(1) | 10.81 | 2.07 |
| Event 1-SD8(1) | 22.14 | 0.56 |
| Event 2-SD8(1) | 37.37 | 2.57 |
| **Geomean (SD8(1))** | **20.76** | **1.44** |

| Combined Events | Copper WER | Zinc WER |
|---|---|---|
| Event 1-DPR2 | 27.00 | 1.47 |
| Event 2-DPR2 | 45.03 | 3.31 |
| Rangefnder WER-SD8(1) | 10.81 | 2.07 |
| Event 1-SD8(1) | 22.14 | 0.56 |
| Event 2-SD8(1) | 37.37 | 2.57 |
| **Geomean (Chollas Watershed)** | **25.54** | **1.71** |

# Project Schedule

- ✓ 1/13/10 – submit draft workplan
- ✓ 2/3/10 – meeting to discuss workplan
- ✓ 1/13/10-2/11/10 – rangefinder Test
- ✓ 2/10/10 – finalize workplan
- ✓ 2/11/10 – 3/31/10 Spring WER Testing – low and high flow events at 2 sites
- 6/25/10 draft progress report (Spring events)
- 10/1/10-12/1/10 Fall WER Testing – 2 events at 2 sites
- 1/20/11 draft WER report
- 1/26/11 presentation of WER study
- Finalize WER report